

HELICOTYLENCHUS SPECIES AS CROP DAMAGING PARASITIC NEMATODES.

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Spiral nematodes (Helicotylenchus spp.) are among the most frequent plant parasitic nematodes found worldwide in temperate and tropical countries. They can be found in association with a wide range of plants. Presently, there are some 198 described species. It is not unusual to find two or more species occurring together.

While several Helicotylenchus species have been implicated as associated with several plant diseases, most of them are not considered aggressive parasites. Only four species have been consistently associated with plant growth suppression. These are: Helicotylenchus dihystra (Cobb, 1893) Sher, 1961; H. multicinctus (Cobb, 1893) Golden, 1956; H. pseudorobustus (Steiner, 1914) Golden, 1956; and H. digonicus Perry 1959. Other species that have been implicated as potentially damaging pests are: H. cavenessi Sher, 1966; H. erythrinae (Zimmermann 1904) Golden, 1956; and H. microcephalus Sher, 1966.

Nematode Behavior: Helicotylenchus species are not consistent in their parasitic habits. They are generally considered to be migratory ectoparasitic feeders. These species feed from outside the roots by inserting their stylets into the epidermis of young succulent roots. Eggs are laid in the soil close to the roots or on the root surface and hatch in two or three days under favorable temperature conditions. The juveniles feed on the roots and develop to maturity. Some species of Helicotylenchus are migratory and semi-endoparasitic and have been observed partially embedded inside the root where they feed on cortical cell tissue as much as 4-6 cells deep. These species may occasionally establish feeding sites in cortical cells (Fig. 1). The posterior portion of their body protrudes from the root (Fig. 2). The nematodes feed on and withdraw the cell contents resulting in cell collapse, which may cause impaired functioning of the feeder roots. Other species of spiral nematodes, such as H. multicinctus, have endoparasitic behavior. After they penetrate, their entire body is inside the root tissues where they feed, induce cavities, and sometimes lay eggs.

Symptoms: Generally, there are no visible aboveground symptoms associated with spiral nematodes feeding on the roots of the many crops they are reported to infect. Occasionally, there are reports that infected plants look unthrifty, stunted, and have sparse and yellowing foliage. However, because of the association of spiral nematodes with other nematode species, reliable data on the damage they may cause are difficult to obtain under field conditions.

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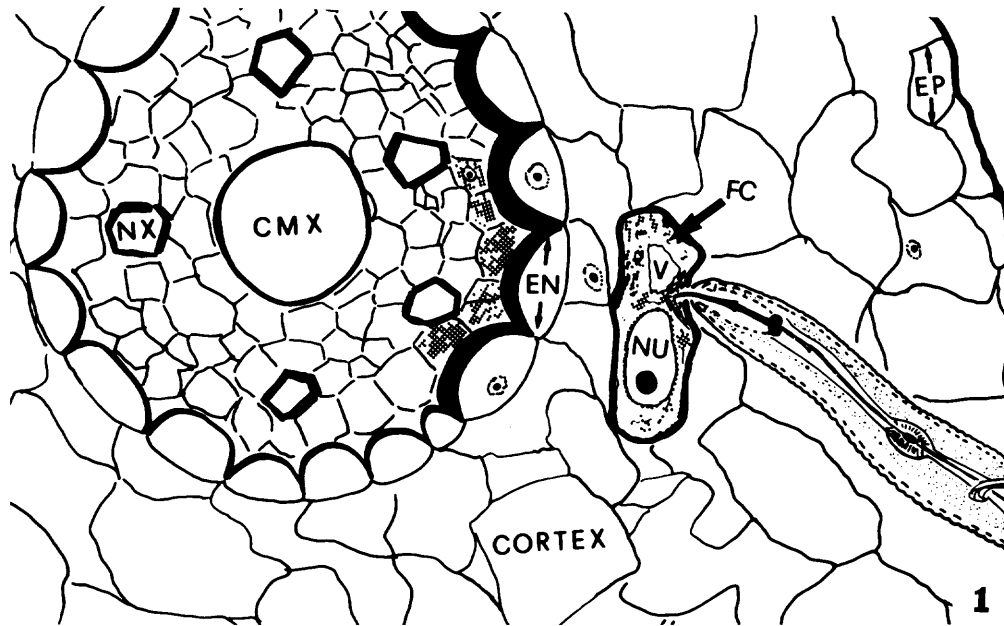


Fig. 1. Composite drawing of feeding area of Helicotylenchus pseudorobustus in corn root. FC = feeding cell, V = vacuole, NU = hypertrophic nucleus, EP = epidermis, EN = endodermis, NX = narrow metaxylem, CMX = central metaxylem. (Courtesy N. Vovlas and R. N. Inserra)



Fig. 2. A female Helicotylenchus pseudorobustus nematode partially penetrating into a corn root with the posterior portion of the body protruding from the root surface. (Courtesy N. Vovlas and R. N. Inserra)

By contrast, parasitism by H. multicinctus has been shown to cause extensive root necrosis and dieback, leading eventually to debilitation of the entire host plant.

Host-Parasite Relations: Of the spiral nematodes associated with plant growth suppression, H. multicinctus is probably the most economically important, because it causes a serious decline of banana (Musa cavendishii) in some banana-growing areas of Israel, Australia, and the Windward Islands. H. dihystra has been reported to parasitize a number of crops, but under field conditions significant negative correlation between nematode density and plant growth has been observed only on infected Kentucky bluegrass (Poa pratensis) and turf in bowling greens in Australia. Plant growth and weight of Kentucky bluegrass also have been suppressed by H. digonicus. Helicotylenchus pseudorobustus has been reported associated with a number of crops, and it may be partly responsible for damage to corn (Zea mays), grasses and some vegetable crops.

Pathogen Status: Many host plants have been exposed to attack by several other spiral nematode species in addition to those species mentioned above. The damage they do is generally not considered extensive. To demonstrate pathogenicity of these Helicotylenchus species, most studies were conducted in the greenhouse, under controlled conditions, using monospecific cultures, usually with nematode densities many times higher than those found under field conditions. Most evidence suggests that spiral nematodes are weakly pathogenic and by themselves cause little or no economic damage, with the exceptions as stated above.

Survey: In Florida, Helicotylenchus species are ubiquitous in field and greenhouse soils. Bureau of Nematology records show many hundreds of spiral nematode occurrences in the state on many agronomic and horticultural crops, and also on weeds in the state. The widespread distribution of spiral nematodes is due mostly to a diverse host range, their lack of specialization in their parasitism, and plant tolerance to infection.

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